Promoting RNG Development for Washington State

Jim Jensen, October 2018
2017 Roadmap

• Builds on prior work
• Benefits: jobs, improve air quality, reduce GHGs
• Rough RNG potential
• Integrate with natural gas utility markets
• Policy options

Find the roadmap here: http://bit.ly/2mowmWn
Biogas is Upgraded to RNG

Biogas flows through a series of processes:
- **Moisture Removal**
- **H₂S Removal Tank**
- **Clean Biogas**
- **Remove Trace Gases**
- **Remove CO₂**

These processes lead to the production of RNG (Renewable Natural Gas), which can be used in various applications:
- **Renewable Compressed Natural Gas (RCNG)**
- **Natural Gas Vehicles**
- **Tube Trucks**
- **RCNG Compress**

RNG can also be liquified into RLNG (Renewable Liquid Natural Gas) for use in shipping.

The RNG is distributed through a natural gas pipeline and can be used for renewable power (RECs) and renewable fuel (RINs).
RNG: Versatile Renewable Energy

Develop local resources, investment, and jobs

• Local facilities and organics resources = resiliency
• Millions of dollars invested to pay local contractors and equipment dealers
• Direct jobs in many fields with a 2-3 job multiplier effect.

Washington Businesses Make a Strong RNG Industry
Anaerobic digestion, RNG, and the industry’s co-products support many local companies. These are just some examples of Washington-based companies that are active in the anaerobic digestion/RNG sector:

- Biogas Energy, Seattle
- Cedar Grove Composting, Seattle
- DariTech, Lynden
- Edaleen Cow Power, Lynden
- Environmental Energy & Engineering, Olympia
- Farm Power NW, Arlington
- FPE Renewables, Lynden
- IGI Resources, Kirkland
- Impact Bioenergy, Shoreline
- Organix, Walla Walla
- Promus Energy, Seattle
- Regenis, Ferndale
- Raincountry Industrial, Arlington
- Trident Processes, Sumas
- Vaughan Company, Montesano
- Whole Energy Fuels, Bellingham
- Yield Biogas Solutions, Blaine
Reduce Air Pollution Health Impacts

Switching from gas or diesel to natural gas and RNG reduces all emissions:

• Carbon dioxide (CO₂) reduced 10-30%
• Carbon monoxide (CO) reduced 70-90%
• Nitrogen oxide (NOx) reduced 75-95%
• Particle matter (PM) reduced up to 90%
• Sulfur oxide (SOx) reduced up to 99%
• Volatile organic compound (VOCs) reduced 89%
GHG Reduction Potential from RNG

Carbon Intensity Values of Current Certified Pathways (2017)

- Calif Blended Gasoline
- Hydrogen
- Ethanol
- Electricity
- Diesel
- Bio-LNG
- LNG
- Bio-CNG
- CNG
- Renewable Diesel
- Biodiesel

EER-Adjusted CI (gCO2e/MI)

Source: California Air Resources Board, 2017
## Current Position

<table>
<thead>
<tr>
<th>RNG Source</th>
<th>Energy MMBtu/yr</th>
<th>Electricity MWh/yr</th>
<th>Fuel DGE/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfills</td>
<td>16,519,219</td>
<td>1,738,865</td>
<td>122,364,586</td>
</tr>
<tr>
<td>Wastewater Treatment</td>
<td>1,716,062</td>
<td>180,638</td>
<td>12,711,571</td>
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<tr>
<td>Agriculture (dairy)</td>
<td>3,011,250</td>
<td>316,974</td>
<td>22,305,566</td>
</tr>
<tr>
<td>Source-Separated Organics</td>
<td>5,430,198</td>
<td>571,600</td>
<td>40,223,692</td>
</tr>
<tr>
<td>Thermal Gasification (woody urban wastes)</td>
<td>23,376,197</td>
<td>2,460,652</td>
<td>173,157,015</td>
</tr>
</tbody>
</table>

2011, 2013, 2017 state data
Landfills
Landfills – Making Progress
WWTPs – Moving Forward
Source-Separated Organics from municipal solid waste

Pacific Coast
Successful Projects Installed:
• British Columbia: Harvest, Surrey
• Oregon: JC Biomethane, new Metro
• California: Sacramento, San Jose

Washington
Large Projects Stalled:
• Cedar Grove and PacifiClean
• Regulations, finance, and NIMBY opposition

Success is building with small-scale, distributed organics digesters.

Photo: Impact Bioenergy
Industrial Food Waste

• Successful projects at AgriBeef and JR Simplot provide internal energy offsets.

• Food processing is the second largest user of electricity in the Northwest.

• Energy generation and fossil fuel use account for vast majority of GHG emissions.
Emerging Technologies

• Thermal gasification offers huge RNG potential from forest and urban woody materials and agriculture residues.
• Potential competition for woody materials—industrial CHP, int’l pellet markets, biojet fuel, etc.
• Power2Gas technology in research and development
Washington RNG Potential

**WA Energy Profile**

Energy = 1,988,000 MMBTU
Nat Gas = 308,000 MMBTU
Diesel = 1 billion gallons

**Est RNG Potential**

Basic: 20,000-26,000 MMBTU
(8-10% of direct nat gas use)
198 million DGE
(20% of diesel)
Advanced: 50,000+ MMBTU
(19% of direct nat gas use)
370 million DGE
(37% of diesel)

*Pop Growth: 25-40% RNG increase*
Lay of the Land

(Major Natural Gas Pipelines in Washington)
# Natural Gas Utilities

<table>
<thead>
<tr>
<th>Utility</th>
<th>Gas Customers</th>
<th>Territory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puget Sound Energy Bellevue, WA</td>
<td>790,000</td>
<td>Central Puget Sound region</td>
</tr>
<tr>
<td>Avista Corp. Spokane, WA</td>
<td>300,000</td>
<td>Eastern Washington and northern Idaho</td>
</tr>
<tr>
<td>Cascade Natural Gas Kennewick, WA</td>
<td>282,000</td>
<td>Scattered among NW, central and southern Washington counties</td>
</tr>
<tr>
<td>Northwest Natural Gas Co. Portland, OR</td>
<td>730,000</td>
<td>Western Oregon and southwest Washington</td>
</tr>
</tbody>
</table>
Natural gas price trends

Source: Northwest Gas Association, 2016 Outlook.
Transportation fuel price forecast

Source: Northwest Gas Association, 2016 Outlook.
RNG Production Costs

Reported Thresholds
Dairy 8,000 Cows
WWTP ~ 17 MGD
Landfill 2+ Mil TIP

$/mmBtu = $/1000 scf

$25.00
$17.00
$7.22***
$3.50
$0.99**
$5.28**
$8.99**
$11.82*

$0
$5
$10
$15
$20
$25

45K cfd Dairy with 1,500 Cows
<100K cfd Dairy with 3,333 Cows
— WWTP <15 MGD
<1 Mil cfd Wastewater Treatment Plant 15-150 MGD
<1 Mil cfd Landfill >3 Mil TIP

cfd = cubic feet per day • MGD = millions gallons per day • TIP = tons in place (landfills)

Road Hazards

1. Limited pipeline infrastructure
2. RNG quality standards for pipeline gas
3. Price trends
4. Scattered RNG sources
5. Insufficient incentives
State Policy Options

- Carbon tax or other price on GHG emissions
- RNG portfolio standard for gas utilities
- Clean fuel standard
- Utility policy (re: interconnection standards, efficiency standards, net metering, standard offers)
- Environmental and waste regulations
- Streamline permitting for new facilities
- Purchasing contracts and preferences, including state highways and fleets
- Financial assistance/incentives (Clean Energy Fund, property tax deferral, sales tax exemptions, etc.)
2018 RNG Bill Passed

Substitute House Bill No. 2580

- Restore lapsed tax incentives for digester projects, expand types of eligible projects and the total incentive value per project.
- Study: quantify near-term opportunities, identify uses by state agencies, evaluate RNG portfolio standard policy option.
- Work with UTC, utilities, developers and other stakeholders on the pipeline gas quality standards.
Thank You

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